

# **3 Summary of the Screening Level Risk Assessment**

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This section summarizes the relevant pathways, COPCs, and uncertainties that were identified in the SLRA. The purpose is to provide context for conducting the BLRA.

The SLRA for the Lower Fox River and Green Bay focused on the potential for human health and ecological risks associated with chemicals in sediments, surface waters, and biota. The SLRA was conducted using the most conservative exposure and effects scenarios in an effort to identify which of the over 300 contaminants previously identified potentially posed risks to human and ecological receptors. Data from 16 separate comprehensive studies conducted on the Fox River and Green Bay by state, federal, university, and private parties were used to assess risk. These studies and additional studies are further used for the BLRA risk assessment (Section 4). The objective of the screening was to identify a smaller list of contaminants that would be carried through to the baseline risk assessment.

## **3.1 Human Health Screening Level Risk Assessment**

### **3.1.1 Potential Pathways at Risk**

The important critical receptors and exposure pathways identified were:

- Recreational anglers and high-intake consumers exposed to chemicals through fish ingestion,
- Hunters exposed to chemicals in waterfowl through waterfowl ingestion,
- Recreational water users exposed to chemicals in surface water and/or sediments through direct contact,
- Drinking water users exposed to chemicals in surface water collected from either the Lower Fox River or Green Bay by municipal water authorities,
- Local residents exposed to chemicals volatilized from surface water via inhalation, and
- Marine construction workers exposed to chemicals in sediment through direct contact.

Of those pathways, the first three were considered to represent the most significant exposure pathways. Risk-based screening concentrations (RBSCs) were developed to screen all contaminants found in the river and Green Bay based on those pathways.

### **3.1.2 Chemicals of Potential Concern**

COPCs were determined by comparing the maximum detected concentrations of contaminants to RBSCs. The RBSCs are concentrations in various media that are intended to be protective of the critical receptors identified previously. The RBSCs were concentrations developed from conservative risk assessment equations. RBSCs were developed for three exposure pathways: fish ingestion, waterfowl ingestion, and direct contact with sediment. The chemicals with maximum detected concentrations that exceeded RBSCs in one or more media included PCBs, dioxins, furans, potentially carcinogenic PAHs, selected semivolatile organic compounds (SVOCs), pesticides, and a number of inorganic chemicals.

COPCs that exceeded RBSCs were ranked based upon relative risk ratios, which are the maximum detected concentration divided by the RBSC. For almost all media and all exposure pathways, PCBs had the highest relative risk ratios; generally one to three orders of magnitude greater than any other compound. Of the three exposure pathways evaluated, the highest relative risk ratios were for PCBs, dioxins, and furans for the fish ingestion pathway. Dieldrin, DDE, and arsenic also had relative risk ratios within an order of magnitude of the relative risk ratios of PCBs for some exposure pathways.

## **3.2 Ecological Screening Level Risk Assessment**

### **3.2.1 Potential Pathways at Risk**

For the ecological SLRA, generic aquatic receptors identified in the river/bay were water column and sediment-dwelling invertebrates, fish, and fish-eating wildlife (birds and mink). Exposure pathways for these receptors included uptake of dissolved chemicals in surface water, ingestion of contaminated sediments, and biomagnification from prey (fish and insects) into insectivorous or piscivorous mammals or birds.

Exposure estimates were determined for specific receptor groups. For example, exposures to fish were distinguished between benthic fish and pelagic fish. Each of these groups has a different trophic role and, therefore, potentially different exposure. Similarly, birds were grouped as omnivorous, piscivorous, or insectivorous.

### 3.2.2 Chemicals of Potential Concern

The following chemicals were identified as ecological COPCs in sediments, tissues, and waters from the Lower Fox River and Green Bay: arsenic, lead, mercury, PCBs, DDT/DDD/DDE, dieldrin, and TCDD/TCDF.<sup>5</sup> Risks from PCBs were two to three orders of magnitude higher (hazard quotients [HQs] greater than 5,000) than any of the metals (HQs of 8 to 41), chlorinated pesticides (HQs of 7 to 51), and PAHs (HQs of 2 to 39). An HQ is the ratio of an exposure point concentration and an effect threshold concentration. HQs are unitless values that are calculated for the estimation of risk.

### 3.3 Chemicals of Potential Concern for the Baseline Risk Assessment

As defined in the Superfund Risk Assessment Guidance (EPA, 1997a), following the completion of the SLRA, a Scientific Management Decision Point (SMDP) was necessary to review the results of the SLRA. The technical team of risk managers, collectively referred to as the Biological Technical Assistance Group (BTAG), were assembled during the SLRA process to specifically address SMDPs and provide technical review. The resource agencies, risk assessors, and technical personnel in the BTAG included:

- Wisconsin Department of Natural Resources;
- U.S. Fish and Wildlife Service;
- U.S. Environmental Protection Agency, Region 5;
- U.S. Environmental Protection Agency, Environmental Response Team;
- National Oceanic and Atmospheric Administration;
- Menominee Nation; and
- Oneida Nation.

Based on the SLRA, the risk managers determined that: 1) potential adverse effects from contaminants in the Lower Fox River and Green Bay are present, and the BLRA is warranted, and 2) the list of chemicals identified as potential risk drivers identified in the SLRA could be focused to a more limited number for the BLRA based upon the magnitude of risk, spatial extent of the contaminants, and presence of fish consumption advisories.

The SMDP was formalized in a memo from WDNR dated August 3, 1998 (Appendix A). The memo identified and justified which chemicals should be

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<sup>5</sup> Although 2,3,7,8-TCDD is the most toxic dioxin congener, all structurally related dioxin and furan congeners will be evaluated for toxicity based on the toxicity equivalency method. The dioxin and furan congeners that will be evaluated are those that have been measured in site media and those that have toxic equivalency factors (TEFs).

carried forward into the BLRA, based on the potential for either human health or ecological risk. Of the 75 chemicals that were above screening level risk criteria, only those with the most potential for adverse risk were carried forward as BLRA COPCs. The process used to narrow this list of COPCs was as follows:

- Spatial extent of the chemical over the study area reaches identified in the SLRA,
- Magnitude of the chemical sediment Hazard Quotient (HQ), and
- Presence of consumption advisories.

The retained COPCs include: PCBs (expressed as total and PCB coplanar congeners), dioxin and furan congeners, DDT and its metabolites DDE, and DDD, dieldrin, arsenic, lead, and mercury. Sediment HQs were greatest for PCBs based on both human health and ecological risk-based screening levels.